IN THE CLAIMS

Please cancel claims 8-17, 23, 28-30, and 32-35 without prejudice or disclaimer. Please add claim 36 as shown below. A complete claim listing is shown below:

1. (Original) A sorption pump comprising:

an adsorption layer comprising an adsorption mesochannel containing adsorption media; and

a heat exchanger in thermal contact with the adsorption layer;

wherein the heat exchanger comprises at least one microchannel; and

wherein the adsorption layer has a gas inlet such that gas directly contacts the adsorption media without first passing through a contactor.

2. (Original) The sorption pump of claim 1 comprising:

at least 2 adsorption mesochannels, each containing adsorption media, interleaved with at least 3 heat exchanger layers, each heat exchanger layer comprising at least one microchannel.

3. (Original) The sorption pump of claim 1 wherein the adsorption layer comprises a plastic and wherein the heat exchanger layer comprises a metal.

4. (Original) The sorption pump of claim 1 further comprising a gas outlet separate from the inlet;

wherein the outlet is disposed such that a gas stream can flow through the inlet, through the adsorption media and out the outlet.

5. (Original) The sorption pump of claim 4 wherein the pump possesses capability such that, if the adsorption media is replaced with an equal volume of 13x zeolite, with a bulk density of 0.67 grams per cubic centimeter, and then saturated with carbon dioxide at 760 mm Hg and 5

°C and then heated to no more than 90 °C at 760 mm Hg, then at least 0.015 g CO_2 per mL of apparatus is desorbed within 1 minute of the onset of heating.

6. (Original) Gas adsorption and desorption apparatus comprising:

at least one adsorption layer comprising an adsorption mesochannel containing adsorption media; and

at least one heat exchanger in thermal contact with the adsorption layer;

wherein the adsorption mesochannel has dimensions of length, width and height;

wherein the height is at least 1.2 mm; and

wherein the apparatus possesses capability such that, if the adsorption media is replaced with an equal volume of 13x zeolite, with a bulk density of 0.67 grams per cubic centimeter, and then saturated with carbon dioxide at 760 mm Hg and 5 °C and then heated to no more than 90 °C, at 760 mm Hg, then at least 0.015 g CO_2 per mL of apparatus is desorbed within 1 minute of the onset of heating.

7. (Original) The apparatus of claim 6 comprising:

at least 2 adsorption mesochannels, each containing adsorption media, interleaved with at least 3 heat exchanger layers, each heat exchanger layer comprising at least one microchannel.

8-17. (Canceled)

18. (Original) Gas adsorption and desorption apparatus comprising:

at least 4 adsorption/desorption cells

each cell comprising at least one adsorption mesochannel in thermal contact with at least one heat exchanger;

wherein the adsorption channel contains adsorption media;

the apparatus connected to a heat source and a heat sink; and

conduits between each heat exchanger and the heat source and the heat sink and also conduits between at least one heat exchanger in each cell and at least one heat exchanger in another cell.

19. (Original) The apparatus of claim 18 wherein the at least one heat exchanger comprises a microchannel heat exchanger.

20. (Original) A sorption pump, comprising:

an adsorption layer comprising an adsorption channel containing adsorption media; and

a mesochannel heat exchanger in thermal contact with the adsorption layer;

wherein the mesochannel heat exchanger has a fluid flowing therethrough that has a high thermal diffusivity, such that the characteristic heat transport time of the fluid in combination with the mesochannel heat exchanger is a value no greater than 10 seconds.

21. (Original) The sorption pump of claim 20 wherein said fluid is a liquid metal or a silicone-based fluid.

22. (Original) A multi-cell sorption pump, comprising:

at least six sorption cells; wherein each sorption cell comprises at least one adsorption layer, and at least one heat exchanger layer;

thermal connections connecting each sorption cell to at least two other sorption cells and to a heat source and to a heat sink, such that each sorption cell can cycle thermally from adsorption to desorption and back to adsorption by sequentially receiving heat from said at least two other sorption cells prior to receiving heat from the heat source, and then sequentially giving up heat to at least two other sorption cells prior to giving up heat to the heat sink, such that thermal recuperation is provided.

23. (Canceled)

24. (Original) The multi-cell sorption pump of claim 22, wherein the heat source is selected from the group consisting of an electrical resistor, a process technology, solar power, nuclear power.

25. (Original) The multi-cell sorption pump of claim 22, where the thermal connections are heat switches.

26. (Original) The multi-cell sorption pump of claim 22, wherein the thermal connections comprise fluid loops.

27. (Original) The multi-cell sorption pump of claim 22, wherein the sorption pump incorporates mesochannel sorption channels, and wherein the sorption pump incorporates mesochannel heat exchange channels.

28-30. (Canceled)

31. (Original) The sorption pump of claim 5 where the adsorption media is heated to 90°C by flowing warm water at 90°C through the heat exchange channels.

32-35. (Canceled)

36. (New) An air treatment system comprising the sorption pump of claim 1, comprising:

an oxygen source;

a first sorption cell comprising the sorption pump of claim 1 wherein the adsorption media comprises a water adsorbent;

a second sorption cell comprising the sorption pump of claim 1 wherein the adsorption media comprises a water adsorbent;

a third sorption cell comprising the sorption pump of claim 1 wherein the adsorption media comprises a CO_2 adsorbent; and

a fourth sorption cell comprising the sorption pump of claim 1 wherein the adsorption media comprises a CO_2 adsorbent.